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A Survey of Parasites Found In Commonly Consumed Vegetables In Awka Metropolitan Market, In Anambra State, Nigeria

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ABSTRACT

A study was conducted on common vegetables sourced from a major market in Awka metropolis of Anambra state. Ten (10) different types of vegetables such as tomato(*Solanum lycopersicum L.*) curry leaf (*Murraya koenigii)*, Garden egg (*Solanum macrocarpon,)*, Pumpkin leaf (*Telfairia occidentalis,)*, carrot (*Daucus carota)*, water leaf(*Talinum Triangulare,)*, scent leaf (*Ocimum gratissimum*), green beans (*Phaseolus vulgaris*), okro (*Abelmoschus esculentus)* and green leaf (*Amaranthus hybridus;A creantus)* were obtained from different vendours in the market and screened using sedimentation method for parasitological examination, from sample. Data were analyzed using SPSS for windows version 16.0. Statistical tests were performed at the level of significance of 5%. Ova, larva, cyst, egg and trophozoites of intestinal parasites were discovered. Out of the total species that were examined, 9 species were positive with intestinal parasites in which curry leaf (*Murraya koenigii)* recorded the highest parasite infestation (28.08%) and garden egg (*Solanum macrocarpon)* recorded the zero-parasite infestation (0.00%). The parasites recovered were showed that *Entamoeba histolytica had* the highest infestation rate of (78.77%), *Strongyloides stercolaris* (13.01%), *Gardia lamblia* (5.48%), Hookworm *Ancylostoma duodenale, A. ceylanicum,* (2.05%), *Ascaris lumbricoides* with the least infestation rate of (0.68%). Based on the finding there is a strong indication that human parasites can be acquired through consumption of these vegetables, especially when not properly and hygienically prepared before consumption.

Keywords: Parasite, Edible vegetable, Awka Metropolis.

Aims Research Journal Reference Format:

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INTRODUCTION

Performance can be defined as the accomplishment of a given task measured against pre-set known standards of accuracy, completeness, cost and speed. Performance may be understood as “the potential for future successful implementation of actions in order to reach the objectives and targets” (Lebas, 2015).

1. INTRODUCTION

Consuming fresh vegetables usually reduces the risk of stroke, cardiovascular diseases, and protects someone against certain types of cancers (Alhabbat,2015). Vegetables are essential for a healthy human body moreover, vegetables are vital sources of energy that are depended upon by all levels of human as food supplements or nutrients (Simon-Oke *et al.,* 2014). They substantially improve food quality as rich sources of water, vitamin C, carotene, mineral elements such as iron, and vitamins including thiamine (vitamin B12), niacin and riboflavin (Nazemi *et al.,* 2012). Intestinal parasitic diseases are of a great public health problem in the developing countries due to poor sanitation and inadequate personal hygiene (Stekette, 2003). The transmission of intestinal parasitic infection has been considered to increase due to frequent use of untreated human or animal dung as manure in cultivation by local farmers. Consumption of raw or un-hygienically prepared vegetables such as carrot, garden egg, tomato, okra, curry leaf, green peas, green beans, water leaf, lettuce, are considered to be risk factors for human parasitic infection

Food items which are usually consumed raw, especially fruits and vegetables, are potential sources of infection. In most cases, fruits and vegetables are eaten raw or slightly cooked in order to retain the natural taste and to preserve heat labile nutrients. This practice, however, facilitates the transmission of food-borne infections (Adejumoke and Morenikeji, 2015). e.g., vegetables become a potential source of human infections like enteric bacterial, viral and parasitic pathogens by contamination during production, collection, transport, preparation and/or during processing (Alhabbal, 2015). Additionally, the sources of contamination more often are soil, faces (human and animal origin), water (irrigation, cleaning) (Alade *et al.,* 2013). More still, contamination may also occur when fresh vegetables are rinsed and sprinkling with contaminated water (Olyaei and Hajivandi, 2013).

Recently, it has been reported that there is an increasing number of cases of food-borne illness mainly linked to eating fresh vegetables (Olyaei and Hajivandi, 2013). Parasitic infections lead to about 300 million severely illnesses with approximately, 200,000 deaths occurring in developing countries (Duedu *et al.,* 2014). Tremendous outbreaks of intestinal parasitic infections that were associated with raw vegetables have been reported from developed and developing countries as well (Ul-Haq *et al.,* 2014) these probably were due to poor sanitation and inadequate personal hygiene (Tefera *et al.,* 2014). Several surveys have been done in different parts of the country such as Jos (Idahosa, 2011), Ilorin (Alade *et al.,* 2013), Ondo (Simon-Oke *et al.,* 2014), Zamfara (Shehu and Amina, 2014); indicated that the vegetables can be a major source for transmitting protozoan cysts (E. *histolytica;* Giardia *lamblia;* E. *coli;* Balantidium *coli)*, oocysts (*Isospora belli; Cryptosporidium spp.*) and helminthes' eggs and larvae (*Strongyloidesstercoralis; T. trichiura; Enterobius vermicularis; Fasciola hepatica; A. lumbricoides; Toxocara spp.; Hymenolepis nana; Hymenolepisdiminuta; Taenia spp*).

Notwithstanding, eating of raw vegetables and salads is the most common practice among our society. The cultivation of Vegetables and fruits for commercial and domestic purposes in Nigeria is mostly carried out by peasant farmers who depend on irrigation and or natural rainfall (Larry, 1998). Most farmers use untreated animal and human waste as manure, which are known to contain various species of parasites that are of medical and veterinary importance (Oluwasola et al.,2020). Some of the water bodies used for irrigation are also polluted with parasites infected excreta that could lead to recycling (Al-shawa and Mwafy, 2007).

The primary sources of contamination are soil, sewage, human feces, animal manure, and water (irrigation and cleaning). Similarly, both domestic and wild animals contribute directly and significantly to the contamination of vegetables. Much has not been reported in this Nobel topic, the scarcity of data on this topic led to the current survey to generate more information on the knowledge gaps in this field.

2. MATERIALS AND METHODS

Area of Study

Awka is the capital of Anambra state, Nigeria. With an estimated population of over 2.5 million People (NPC, 2018). Awka lies within longitude $6^{o}12'$ $25^{o}N$ and 70^{o} $04^{o}04E$ and latitude. The town stretching from 8km in the East-west direction along the Enugu-Onitsha Expressway and about 5km in. North-south orientation. The town is about 12,007 hectares in dimension. It is in the center of densely populated Igbo heartland in southeastern Nigeria. Awka is in the tropical rainforest at Nigeria, and experience two distinct seasons dry and wet seasons. The major occupation of the people in Awka is trading, but in the rural dwellings, a lot of individuals indulge in livestock rearing and a few have the free-range system for pig farming.

Collection Of Samples

Some edible fruits and vegetables were bought from Eke Awka market around 9:00am – 10:00am, some of the vegetables include carrot, garden egg, tomato, okra, curry leaf, Green peas, green beans, water leaf, lettuce. Collection of samples was done and transported to laboratory in clean and sterile polyethylene bags and examined for presence of ova or larva of parasites within 6 hours of collection

Preparation And Examination Techniques

Vegetables were washed separately on separate beakers containing 200mls of distilled water. Each suspension was strained through double layered sieve, which filter off coarse sandy particles but allowed the passage of parasites eggs and larvae. The filtrate was transferred to a clean specimen bottle and labeled properly in preparation for examination

Sedimentation Method

Using a pipette, 2ml of the filtrate was collected from the specimen bottle and transferred into a clean test tube; the filtrate was centrifuged at 2000RPM for 5 minutes and the supernatant was discarded ;10mls of 10% formalin was added to the sediment and allowed to stand for 5 minutes ; after 5minutes, 3ml of ether was added, mixed thoroughly using glass rod and centrifuged again for 3 minutes; after 3minutes, the supernatant was decanted and the sediment was dropped on clean microscope slide. A drop of iodine was added, covered with cover slip and examined under a microscope using x10 and x40 objectives

The parasites identification is based on size, color and morphological features

3. RESULTS

Table 1- Species of Parasites and the stages recovered from the ten vegetables obtained from Awka market

Vegetables	Weight (g)	Species of Parasite Seen	Stage of Parasite
Pumpkin leaf	473	*G.lambia*	Trophozoite
Curryleaf	119	*S.stercolaris* Hookworm *E. histolytica*	Larva Cyst Cyst
Waterleaf	415	*G. lambia* *Entamoeba histolytica*	Trophozoites Cyst
Scentleaf	208	Hookworm *A. lumbricoides* *S. stercolaris*	Ova Larva Larva
Carrot	500	*S. stercolaris* *E. histolytica*	Larva Cyst
Greenbeans	186	*E. histolytica*	Cyst
Tomato	1000	*E. histolytica*	Cyst
Okra	500	*E. histolytica*	Cyst
Garden egg	849	-	-
Greenleaf	348	*E. histolytica* *Gardialambia*	Cyst Trophozoites

Table 2 revealed that the highest abundance of parasites was recovered from curry leaf (28.08%) followed by water leaf (23.29%) while no parasite was recovered in garden egg. There was no significant difference in the number of parasites among the ten vegetables sampled (P>0.05).

Table 2: Percentage occurrence of parasites recovered from the ten vegetables sampled at Eke Awka

Vegetables	*E. histolytica*	*G. lambia*	*S. stercolaris*	*A. lumbricoides*	Hookworm	Total	Abundance (%)
Pumpkin leaf	0	2	0	0	0	2	1.37
Curry leaf	26	0	13	0	2	41	28.08
Water leaf	30	4	0	0	0	34	23.29
Scent leaf	0	0	2	1	1	4	2.74
Carrot	15	0	4	0	0	19	13.01
Green beans	7	0	0	0	0	7	4.79
Tomato	2	0	0	0	0	2	1.37
Okra	22	0	0	0	0	22	15.07
Garden egg	0	0	0	0	0	0	0.00
Green leaf	13	2	0	0	0	15	10.27
					Total	146	100

Table 3 revealed that *E. histolytica* had the highest abundance (78.77%) followed by *S. stercolaris* (13.01%) while *A. lumbricoides* had the least (0.68%). There was significant difference in the number of parasites among the ten vegetables sampled (P<0.05).

Table 3: Abundance of parasites species

Vegetables	*E. histolytica*	*G. lambia*	*S. stercolaris*	*A. lumbricoides*	Hookworm
Pumpkin leaf	0	2	0	0	0
Curry leaf	26	0	13	0	2
Water leaf	30	4	0	0	0
Scent leaf	0	0	2	1	1
Carrot	15	0	4	0	0
Green beans	7	0	0	0	0
Tomato	2	0	0	0	0
Okra	22	0	0	0	0
Garden egg	0	0	0	0	0
Green leaf	13	2	0	0	0
Total parasites	**115**	**8**	**19**	**1**	**3**
% Occurrence of parasites	**78.77**	**5.48**	**13.01**	**0.68**	**2.05**

4. DISCUSSION

The present study has attempted to determine the prevalence of intestinal parasites on some fruits sold at Eke -Awka markets in Awka south, Anambra. Ten different species (Ugu leaf, curry leaf, water leaf, scent leaf, carrot, green beans, tomatoes, okro, garden egg, and green leaf) of vegetables were examined, out of which 9 species (ugu, curry, water leaf, scent leaf, carrot, green beans, tomatoes, okro and green leaf) were positive for intestinal parasites which curry leaf has the highest abundance of parasite (28.08%) while garden egg recorded the least abundance of parasite (0.00%). This result is similar to the work carried out by Adejumoke and Morenikeji, (2015) on the prevalence of intestinal parasites on fruits available in Ibadan markets where 34 (35.4%) of fruits were positive for intestinal parasites and pineapple had the highest percentage of parasite contamination of 10 (62.5%).

In another similar study Uneke (2009) in Abakaliki, reported that of the 34 ova isolated from fruits, 30 were positive for pineapple. This is due to the uneven surface of pineapple fruit which make the parasitic eggs, larva or cyst attached to the surface of fruit more easily either in the farm or when washed with contaminated water. Watermelon and water leaves recorded the least contamination with parasites from my result 9 (30.0%). This is due to the smooth skin of the fruits and leaves which makes it easy for the eggs, larvae or cysts of the parasites to be washed off even with the slight washing which is done at the point of harvest or prior to sale.

In the overall, five different types of parasites were isolated from 10 vegetables sold at Eke-awka market. They include cyst of *Entamoeba* histolytica (78.77%), egg of *Ascaris* lumbricoides (0.68%), trophozoites of *Gardialambia*(5.48%), larva of *Strongyloidesstrecularis*(13.01%), ova of hookworm (2.05%). In this study, cyst of *Entamoeba histolytica* were the most frequently encountered parasites with abundance of (78.77%).

The result is similar with the earlier reported of (33.30%) for *Ascaris lumbricoides* as the highest out of (51.60%) positive for parasites contamination on vegetables (Alemu et al., 2019), However, the intestinal parasites isolated in this work differ from those isolated from other part of Nigeria. Damen *et al* (2007) isolated larvae of *Strongyloidesstrecularis* (12.60%), egg of *Enterobius vermicularis* (2.42%), eggs of *Clonorchis sinensis* (4.76%) and cysts of *Entamoeba histolytica* (0.62%) from fruit samples in Kogi. In Western part of Nigeria, isolated three different types of intestinal parasites from 96 fruits. These parasites include ova of *Ascaris lumbricoides* 19(55.9%), ova of hookworm 11(32.3%) and *Strongyloides strecolaris*(11.8%).

In southwest Ethiopia Tefera *et al.* (2014) isolated larvae of *Strongyloides stercolaris* (21.9%), ova of *Toxocara* species (14.7%), *Cryptosporidium* species (12.8%), *Hymenolepis nana* (8.3%), *Gardia lamblia* (7.5%), *Ascaris lumbricoides* (6.7%), *Entamoeba histolytica dispar*(5.3%), *Cyclospora* species (5.0%) and *Hymenolepis diminutive* (1.4%) from fruits and vegetables (Tefera *et al.,* 2014). Geographical location, type and number of water bodies used for irrigation, and post harvesting handling methods of vegetables are different from country to country and region to region. This could be the reason for variation in prevalence in different parts of the world. Despite variation in isolated parasites, ova of *Ascaris lumbricoides* and ova of hookworm were common to all fruits and vegetables in all the studies, this could be due to the fact that these parasites can withstand a wide variety of adverse environmental conditions which could serve as an indication of water pollution as a result of indiscriminate defecation resulting in pollution of water and farmlands (Damen *et al.,* 2007). However, there was a significant difference ($P<0.05$) in the prevalence of intestinal parasites on type of fruit sampled.

5. CONCLUSION

In conclusion, the result from this research shows moderate contamination levels of vegetables product with intestinal parasites from Eke-Awka market in Anambra State, indicating presence of a great risk of acquiring intestinal Parasite infections by eating improperly washed and uncooked vegetables. It is assumed that these contaminations ranged from one factor to the other such as contamination of soil by human and animal faces, poor sanitary environment of the markets, and unhygienic transportation of the produce to the markets. The findings also sound warning both to the seller and the consumer or indiscriminate handler of such product with contamination

Authors' Contributions

OVO—conceived the idea and wrote the manuscript. IIB, and NIC—collected the data and participated in writing the manuscript; All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

Availability of data and materials
The study data is available on personal request to the corresponding author.

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